Report
of
First Conference
to
Establish Optometric Standards

At St. Louis, Missouri
January 13th and 14th, 1922.

Edited by
William S. Todd
Chairman Department of Education
American Optometric Association

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FIRST CONFERENCE TO ESTABLISH
OPTOMETRIC EDUCATIONAL STANDARDS
AT ST. LOUIS MO
JAN 10TH TO 14TH 1922
PHOTO A.W. SANDERS

PHOTOGRAPH OF CONFERENCE

List of those present

Left to Right:

George A. Barron, Boston, Mass.

Frederic A. Woll, New York City.

Harry M. Bestor, Rochester, N. Y.

W. B. Needles, Kansas City, Mo.

Joseph I. Pascal, New York City.

Ernest Petry, Rochester, N. Y.

Howard C. Doane, Boston, Mass.
(Secretary of the Conference)

William S. Todd, Hartford, Conn.
(Chairman of the Conference)

Oliver Abel, St. Louis, Mo.
(President A. O. A.)

Charles Sheard, Southbridge, Mass.

Howard D. Minchin, Columbus, Ohio.

Ernest A. Hutchinson, Los Angeles, Cal.

A. P. DeKeyser, Portland, Oregon.

Theodore Klein, Boston, Mass.

L. L. DeMars, Minneapolis, Minn.

P. H. Howard, St. Louis, Mo.

H. Frank Brown, St. Louis, Mo.

Claude Wolcott, Dallas, Texas.

CONTENTS

PREFACE

by

Frederic A. Woll, Ph. D.

The contents of the following pages are the result of the serious endeavor of a group of earnest men who at the St. Louis Conference in January of this year, represented both the Boards of Optometry Examiners and the Optometry Schools.

For a long time it has been their serious concern to see optometry courses, optometry examinations, and optometry legislation thoroughly organized and standardized. To accomplish those desired ends must take a long time, thoughtful planning, and wise procedure. The present suggestions are, therefore, rather timidly presented but in the hope that they will establish a real beginning which will finally result in a much needed uniformity of instruction, examination, and legislation. Further, it has been constantly present in the minds of all that the matter which may now be regarded as essential will in the time to come be either entirely cast aside or relegated to the place of the inconsequential; for, after all, the only thing in the world that is staple is change.

Kindness in criticism is encouragement which stimulates further effort.

New York City,
May 1st, 1922.

OPTOMETRY

Past and Present

by

William S. Todd, Chairman of the Conference.

The first Conference on Optometric Education was held in the City of St. Louis, Missouri on January 11th and 12th, 1922. It resulted in attaining one of the greatest achievements yet accomplished in a constant endeavor to place optometry on a solid foundation. This year at our Annual Convention in Indianapolis we will celebrate the twenty-fifth anniversary of the founding of the American Optometric Association. As we look over the history of our organization, we see steady advancement. A large number of us remember the formation of various educational bodies that have been formed within and without the American Optometric Association, and credit must be given to the men who had to do with the formation of such bodies as the Scientific Section, Physiological Section and Academies as well as to the men who have lectured and written helpful literature for optometrists without fee or reward. A number of our men in the past have worked hard to raise standards, and even in the face of discouragement, made wonderful progress.

Since the Department of Education was formed our leading educators and optometrists have continually deplored the fact that we — as also other professions — did not have proper standards of education. The Council of Optometric Education was primarily formed for the purpose of having some supervision over education in our optometry schools, but it has been felt that until we had a syllabus on each subject we could never expect to set standards either in schools or in examinations by our State Boards.

Our lamented friend Albert Myer was a seer, and those of us who were privileged to know him intimately were continually surprised at the great vision he had of optometry. Part of the work we are doing today in our Department of Education is what he outlined years ago. Like most pioneers he was ahead of his time. One of the fruits of his wisdom, however, was the formation of an Association of Boards of Examiners now known as the International Association of Boards of Examiners in Optometry. This association has already done good work, and it will be of greater value in the future.

Another man with a vision is Harry M. Bestor. At our convention in Rochester in 1919 he suggested a joint meeting of the International Association of Boards of Examiners and the Fed-

eration of Optometry Schools, which has become an actual event with the result that some real constructive work has been accomplished. Last June in New York City it was decided to ask the American Optometric Association to finance a conference on Optometric Education — this conference to consist of one member of each Optometry school in the Federation with the President and Secretary of the International Association of Boards of Examiners in Optometry and one member of the Council on Optometric Education. To this the convention of the American Optometric Association agreed and the conference was held in St. Louis.

Much preliminary work was done by and a good deal of the success is due to Dean Ernest Petry of Rochester, New York, Secretary of the Federation of Optometry Schools, and to Howard C. Doane, Boston, Massachusetts, Secretary of the International Association of Boards of Examiners in Optometry in planning the conference. Mr. Doane did a very commendatory piece of work for the Council on Optometric Education in arranging the classification of Schools and preliminary educational requirements. It is not out of place to mention the valuable assistance from Dr. A. B. Meredith, State Commissioner of Education for Connecticut, in this connection. His suggestions were most valuable. It must be remembered there are states where a four year high school course or its equivalent is required before taking the examination before the state boards. The preliminary educational requirements for Grade A Schools as prepared by Mr. Doane and found in this booklet were considered by the conference in St. Louis as very satisfactory.

One of the most outstanding features of the Conference is the work of Professor Frederic A. Woll of New York City, who prepared the syllabuses, and it represents months of hard work. He has been willing all his life to make any sacrifice he could for optometry. This last work is perhaps his greatest. It may be revised in the years to come, but its sound standards will always form a firm foundation upon which shall be built a more comprehensive structure than can be erected at the present time. From now on our schools know what shall be taught and Boards of Examiners will have a guide to follow in making their examinations more systematic and uniform.

The suggestion of Professor Ernest A. Hutchinson of Los Angeles, California to form a central examination board and the resolution adopted calling on the Department of Education to formulate plans for its formation will need a good deal of careful thought before it is put into operation. Professor Hutchinson thinks if this plan is carried out it may prove a satisfactory basis upon which reciprocity may be established. It is hoped that the initial plans will be presented at the next A. O. A. Convention which is to be held in Indianapolis.

In the teaching of optometric subjects it is often necessary to search in several books and select a little from each. This is most unsatisfactory. Our faculty members at the conference drew attention to the need of a relief from this inconvenience and the Committee on Resolutions suggested the formation of a committee for investigation, report, and suggestion. The great difficulty is in getting men to prepare text-books and in having the text-books published. Text-books, as a rule, are not profitable to either author or publisher. If we are to produce these works, therefore, it will require financial assistance in some form or other.

The resolution on school publicity provides food for thought on the part of all who have optometry's best interest at heart. This work has already had its inception in the work of the Department of Publicity, especially under the direction of Reginald C. Augustine, but it must be carried further. We must provide scholarships to be given by individuals and societies to help worthy students to take optometry courses in our schools — they in turn to repay these loans and thus perpetuate the good work. This is done in some of our religious bodies and quite a number of present day ministers, business men, and professional men were helped in this way. We can do the same for optometry and must do it.

In conclusion I want to offer my appreciation of the sacrifices made by the men who attended this Conference without any remuneration in order to lay the foundation of Optometric Education. Their only reward is a knowledge of doing their duty.

Hartford, Conn.
March 21, 1922.

THE FUTURE OF OPTOMETRY.

By
CHARLES SHEARD, Ph. D.
Honorary President, Federation of Optometry Schools

Everyone who has thought upon the important matter of the future of optometry — whether this person be an educator, a practitioner, or even a member of another profession having in hand the care of the human body — must have reached the conclusion that the future of optometry depends almost entirely upon its educational facilities. A very prominent ophthalmologist once said to me that optometry would live and become a science of exactness practiced by men of the proper training, only through the establishment of a few high grade courses in high grade institutions of instruction. In short, the optometric laws which now exist are schoolmasters forcing applicants to practice to present some evidence of proper training. But the legal requirements in an educational way in optometry must always remain, in large measure, below our true standard of education as determined by schools and colleges. And the laws have specified in a few lines the subjects and topics of examination, but this has in no wise led to coordination of materials in the courses taught nor to an intelligent cooperation between teachers and board examiners. Everyone, whether teacher or examiner, has done as he or she thought fit and proper, with the result that great disparity of ideas and often chaos has arisen.

To the end, therefore, that definiteness of curricula, syllabi of courses, character of instruction, number of hours of didactic and clinical work and other important details of coordinating schools in their teaching and making possible some intelligent cooperation between examiners, on the one hand, and teachers and their students on the other hand, and to the end that a more uniformly trained and, it is to be hoped, better trained young practitioner might be turned into this important work, this first congress on optometric education met in St. Louis in January, 1922. After many hours of discussion and deliberation a *minimum* schedule was determined upon; the maximum length and content of instruction being left to each school. The maximum content and length of courses will be a matter of determination years hence. This conference attempted only the solution of the problem of a minimum to which all of the representatives of the schools and educators present could agree. Its great value is obvious. That this matter of education will need frequent discussions with recommended changes is equally obvious. To my mind, we have simply laid down a fair foundation upon which to build in the years to come. The surface of this question of education was simply scratched at our first conference. The future has in store much that must demand attention.

REPORT OF CONFERENCE

by

Howard C. Doane, Secretary of the Conference.

AN EPOCH MAKING EVENT.

First Conference on Optometric Education held at The Planters Hotel, St. Louis, Mo., January 11 and 12, 1922.

This important event is the result of the resolution passed at the Convention of the American Optometric Association in New York City, in June, 1921, authorizing a Conference between representatives of the International Federation of Optometry Schools, the Council on Optometric Education and the International Association of Boards of Examiners in Optometry, for the purpose of establishing educational standards.

History has been made and the results of this Conference mark one of the greatest if not the most important steps in the advancement of Optometry as a profession. A comprehensive program has been adopted which establishes minimum standards for both preliminary and Optometric education, a plan for classifying Optometry Schools together with complete and comprehensive syllabuses in the subjects which should be covered in an approved course of Optometric education.

Delegates representing International Federation of Optometry Schools:

Dr. Howard D. Minchin, Columbus, Ohio.
Ohio State University.

Dr. A. P. DeKeyser, Portland, Oregon.
DeKeyser Institute of Optometry.

Dr. E. A. Hutchinson, Los Angeles, California.
Los Angeles Medical School, Ophthalmology and Optometry.

Dr. Louis L. DeMars, Minneapolis, Minnesota.
DeMars School of Optometry.

Dr. W. B. Needles, Kansas City, Missouri.
Needles Institute of Optometry.

Dr. H. Frank Brown, St. Louis, Missouri.
Missouri College of Optometry.

Dr. Ernest Petry, Rochester, N. Y.
Rochester School of Optometry.

Dr. Frederic A. Woll, New York City.
Columbia University Optometry.

Dr. Theodore Klein, Boston, Mass.,
Massachusetts School of Optometry.

Dr. George W. McFatrich, Chicago, Ill.
Northern Illinois College of Optometry.
Dr. George A. Barron, Boston, Mass.,
University of Massachusetts.
Dr. Claude Wolcott, Dallas, Texas.
Texas College of Optometry.
Dr. Joseph I. Pascal, New York City.
American Institute of Optometry.
Dr. P. H. Howard, St. Louis, Missouri.
Missouri College of Optometry.

Delegate representing Council on Optometric Education of the A. O. A.:
Dr. Charles Sheard, Southbridge, Mass.

Delegate representing the Executive Council of the A. O. A.:
Dr. H. M. Bestor, Rochester, N. Y.

Delegates representing International Association of Boards of Examiners in Optometry:
W. S. Todd, President, Hartford, Conn.
Howard C. Doane, Secretary, Boston, Mass.

MINUTES.

Meeting called to order Wednesday, January 11th, 9.30 A. M., by W. S. Todd, Chairman, Department of Education of the A. O. A., President of the International Association of Boards of Examiners in Optometry and Chairman, Council on Optometric Education.

Chairman Todd outlined the purposes of the meeting to establish Optometric Educational Standards for the profession of Optometry.

Oliver Abel, President of the American Optometric Association, spoke to the delegates on the importance of the Conference and expressed confidence that the body would adopt a constructive program which would be of untold benefit to the profession.

Howard C. Doane, Secretary of the International Association of Boards of Examiners in Optometry, Boston, Mass., was appointed Secretary of the Conference.

W. S. Todd was then elected permanent Chairman of the Conference.

Dr. Petry moved that a Committee of five including the Chairman be appointed by the Chairman to constitute Committee on Resolutions. Seconded by Dr. Sheard. After discussion, motion was amended to read: "Committee of Seven." Motion carried.

The Chairman appointed the following Committee:

Committee on Resolutions:
W. S. Todd, representing Department of Education.

Dr. Chas. Sheard, representing Council on Optometric Education.
Howard C. Doane, representing International Association of Boards of Examiners.
Representing Federation of Schools:
Dr. Ernest Petry,
Dr. F. A. Woll,
Dr. E. A. Hutchinson,
Dr. W. B. Needles.

On motion of Secretary Doane and duly seconded, it was voted to dispense with discussions of the subjects assigned to delegates until the full program had been completed.

PROGRAM.

"Classification of Optometry Schools and the Essentials of an Acceptable Optometry School." A complete synopsis covering the subjects was submitted to the Conference. Howard C. Doane, Secretary of the International Association of State Boards.

"Preliminary Educational Requirements." Dr. Theodore Klein, Massachusetts School of Optometry.

"Elimination of Apprenticeship Clauses from Optometry Laws." Dr. A. P. DeKeyser, DeKeyser School of Optometry.

"Optometric Curriculi and Regulations in America and Europe." Dr. Charles Sheard, Honorary President Federation of Optometry Schools.

Meeting adjourned 12.30.

1.30 P. M., program continued:

"Syllabuses on the Several Subjects in which State Board Examinations are given." Complete syllabuses on the following subjects were submitted to the Conference:

Anatomy and Physiology of the Eye.
Theoretic Optometry
Theoretic Optics
Practical Optometry
Practical or Mechanical Optics
Physiological Optics
Diseases of the Eye

Dr. Frederic A. Woll, Columbia University.

"Abolishment of Correspondence Courses." Dr. P. H. Howard, Missouri College of Optometry.

"Central Examination Board and Reciprocity." Dr. Ernest A. Hutchinson, Los Angeles School of Ophthalmology and Optometry.

"Classification of Optometry Schools." Dr. W. B. Needles, Needles Institute of Optometry.
"Optometric School Publicity." Dr. H. M. Bestor, Rochester School of Optometry.

Then followed an extended discussion of the subjects taken in order on the program. Following this there was an informal discussion of the advisability of offering an extended course of four years or more.

Adjourned at 5.45 P. M.

Thursday, January 12th.

9.30 A. M.

Continuation of discussion of subjects presented.

Upon motion made and duly seconded, it was voted that a special committee of three be appointed to draw up resolutions with reference to the examinations soon to be given by the Texas State Board.

Chairman Todd appointed Dr. Bestor, Dr. Minchin and Dr. DeKeyser.

10.30 A. M.

Voted to adjourn until 3.30 P. M. to give opportunity for resolutions committee to work and bring in report.

3.30 P. M.

Committee on Resolutions report read by Dr. Petry, Secretary of Committee.

Resolution No. 1: Classification of Schools, etc. Accepted.

Whereas, Optometry as a profession has made unprecedented advancement and is now recognized as a specialized work requiring highly specialized training, and

Whereas, The Council on Optometric Education after an exhaustive study of the educational standards maintained by the Optometry Schools realize the necessity of establishing definite educational standards both preliminary and Optometric and

Whereas, The International Association of Boards of Examiners in Optometry find, upon reports from various State Boards of Examiners, that in order to bring about greater uniformity in Optometry Laws there must be established uniform standards of education, be it

Resolved, That the outline for "The Essentials of an Acceptable Optometry School" and "The Classification of Optometry Schools," prepared by Dr. Doane, be accepted as a standard and be it further

Resolved, That this conference recommends that in all states and provinces where the standards are not equal to these standards, efforts be made to have the laws of the various states and provinces changed to make it possible to carry these standards into effect.

Resolution No. 2. Syllabuses. Accepted.

Whereas, There is a great need for a syllabus to serve as a guide to teachers and students relative to the important topics which should be covered in an approved course of Optometric Education, be it

Resolved, That we accept the Syllabuses prepared by Dr. Woll, as a satisfactory guide upon the subject matter and contents of an accredited two year course in Optometric education.

Resolution No. 3. Apprenticeship. Accepted.

Whereas, The apprenticeship clauses in the various State Optometry Laws permit the licensing of candidates whose qualifications are not in accordance with the new standards of Optometry education, and

Whereas, The apprenticeship clauses are not compatible with the standards of any profession and

Whereas, The apprenticeship clauses minimize the amount of instruction necessary to assure public safety, and

Whereas, Apprenticeship instruction is not even in vogue in trades, be it therefore

Resolved, That this meeting unanimously and without reservation recommends the removal of those apprenticeship clauses by suitable legislation or proper amendment.

Resolution No. 4. Correspondence Course. Accepted.

Resolved, That no credits or diplomas for correspondence courses be given to any person living in the United States of America or Canada, or coming into these countries. This statement shall be included in any and all announcements of such courses.

Resolution No. 5. School Publicity. Accepted.

Whereas, The future existence and prestige of the profession of Optometry is dependent upon the character and educational qualifications of the college educator, State Board examiners and practitioners and

Whereas, In order to maintain a steady influx of such practitioners into the profession, it is necessary to interest in such professional schools a sufficient student body and

Whereas, The tuition and other fees derived from such student bodies do not cover the expenses necessary for maintaining adequate equipment and an efficient faculty and

Whereas, It is possible to combine in an advertising campaign for Optometry students, a publicity campaign which will forcibly convey to the general public the merits and advantages of Optometric practice, be it

Resolved, That the American Optometric Association through its department of publicity, be empowered to inaugurate such a campaign and that sufficient funds be awarded for this purpose. Be it further

Resolved, That the American Optometric Association, through its publicity department, also develop a plan whereby all the High School and University students throughout the country be informed each year as to the advantages of Optometry as a profession and be it further

Resolved, That the American Optometric Association through its publicity department do all in its power to obtain from all Optometric Societies and individuals, scholarships for optical schools.

Resolution No. 6. Central Examination Board. Accepted.

Resolved, That it is the sense of this committee that the Department of Education of the American Optometric Association shall, at the next annual convention of the association in Indianapolis, present a plan for the establishment of a central examining board whose function shall be to prepare and grade examinations as a basis for membership in an academy of the American Optometric Association, to be created by the convention.

That the standard of grading of this central board shall be such that membership in the academy shall be considered as *prima facie* evidence of ability to satisfy the requirements of any and every state board.

That the Department of Education use its best efforts to secure the co-operation of the State Boards to accomplish the following courses of action:

1. The holding of State Board examinations simultaneously in every state in the union.
2. The use of the examinations set by the central examining board by every state board as the basis of their examination in all written work (at their option they may accept the central boards grades.)
3. The acceptance of membership in the academy as a basis of reciprocity.
4. The option to the examinee as to whether he desires simply state license or membership in the academy carrying with it reciprocity subject in every case to the final judgment of each board as to whether the applicant shall be granted a license in the particular state under its jurisdiction.

Resolution No. 7. Night Schools. Accepted.

Resolved, That night school work be limited to a maximum of nine hours of actual class room work for a week and that credit toward the completion of a two years course be given accordingly.

Resolution No. 8. Text Books. Accepted.

Whereas, There is a lack of suitable Optometric text books and instruction and

Whereas, The dignity of the profession of Optometry will be markedly advanced and protected by the publication of such texts

Resolved, That a committee be appointed to determine suitable means for providing this need.

Dr. Sheard moved that report of Resolutions Committee be accepted *in toto*. Seconded by Dr. Petry. Motion carried.

The following motions duly made and seconded were carried:

That the syllabuses as accepted go into effect Sept. 1, 1922.

That the classification of schools go into effect Sept. 1, 1922.

That the resolution on night schools go into effect Sept. 1, 1922.

That the resolution on correspondence courses go into effect at once.

Dr. Bestor for special committee presented Resolution No. 9. Adopted.

Resolution No. 9:

The International Federation of Optometry Schools, the Council of Optometric Education, the Executive Council of the American Optometric Association and the International Optometry Boards of Examiners in conference assembled at St. Louis, Mo., this 12th day of January, 1922, have appointed the undersigned as a special committee to draft a resolution with reference to the Texas situation. In accordance with this we present the following:

Whereas, The Optometrists of Texas will soon be under the necessity of taking the limited examination provided by the Texas Optometry Law and

Whereas, Texas being the last state of the Union to pass an Optometry Law, has among its practitioners a number of Optometrists who have been unable to obtain admission to practice in other states and

Whereas, The experience in other states where such limited examinations have been conducted, has shown that Optometrists often enter such examinations with the understanding or impression that such examinations were merely a perfunctory form and

Whereas, The Optometrists of the United States as evidenced by their constant moral and financial support of the Optometric situation in Texas, feel that the action by your board will either result advantageously or adversely, not only toward Optometry in Texas, but also toward Optometry throughout the entire United States, be it

Resolved, That the execution of the law in the conduct of limited or other examinations be carried out with such a degree of fairness and yet with sufficient rigidity and thoroughness as to leave no room for adverse criticism against your board or against Optometry.

H. M. Bestor,
A. P. DeKeyser,
Howard D. Minchin.

Dr. Sheard presented a special resolution No. 10. Adopted by rising vote.

Resolution No. 10:

Resolved, That the joint Conference on Optometric Education, comprising the Department of Education, the Council on Optometric Education, the International Boards of Examiners and the Federation of Optometry Schools, expresses its appreciation of the many tokens of interest in these meetings and the hospitality shown by the President of the American Optometric Association, President Abel, and the local society of Optometrists and that a copy of these resolutions be transmitted to our hosts.

Dr. Sheard presented a special resolution No. 11. Adopted.

Resolution No. 11.

Resolved, That those of us assembled here in the interests of advancing Optometric education express our appreciation of the splendid services rendered us in our work and deliberations by Howard C. Doane and Dr. Frederic A. Woll.

Dr. Bestor presented a special resolution No. 12. Adopted.

Resolution No. 12:

Whereas, The District of Columbia is the only part of the United States in which the practice of Optometry is not regulated should be representative of highest qualifications and ideals in Optometry and therefore as stringent or even more stringent than the state whose law is the highest, be it

Resolved, That the Educational Council of the American Optometric Association, the International Federation of Optometry Schools and the International Association of Boards of Examiners in Optometry in conference assembled in St. Louis, this 10th day of January, 1922, bring to the attention of the District of Columbia Optometrical Society and others interested in the Optometry bill now before Congress, that the advice and opinion of this conference is that steps should be immediately taken to so alter their present bill as to conform to the requirements of preliminary and professional training as prescribed by the resolutions of this conference.

Chairman Todd spoke with feeling on the important work completed and how much it meant to Optometry. Expressed his appreciation of the monumental work done by Dr. Woll in prepar-

ing the syllabuses, also of the valuable work done by Dr. Doane. He thanked all the members of the conference for their efforts and co-operation in making the meeting such a splendid success.

Dr. Hutchinson called for a rising vote of thanks and appreciation for Dr. Todd as Chairman of the conference, for his splendid work in the Education Department of the American Optometric Association and for his untiring efforts for the uplift of Optometry.

Conference adjourned 6.30 P. M.

CLASSIFICATION OF OPTOMETRY SCHOOLS AND NEED FOR ESTABLISHING THE ESSENTIALS OF AN ACCEPTABLE OPTOMETRY SCHOOL OR COLLEGE.

AS ADOPTED BY THE CONFERENCE.

Optometry as a profession is fast being recognized and, therefore, there is urgent need for establishing suitable educational standards for the highly specialized work in which the optometrist is engaged.

The future optometrist must be equipped not only with a fundamental education but with a special education and training so that he may the better meet people of all classes and the more easily understand and grasp the scientific problems which may be presented to him. That will enable him to render a more distinctive and a more professional service.

The following outline deals with a proper classification of optometry schools. It is based on the results of a careful study and a comparison of the present day optometry schools with the schools and colleges of other professions. It establishes the essentials of an acceptable optometry school or college. Those essentials are based on such necessary equipment, educationally, as the present day optometrist should possess.

CLASSIFICATION OF SCHOOLS

Basis of 100 points, grouped under four general heads. Each group allowed possible 25 points.

Schools qualifying with 70 points or more rated as Class A.
Schools qualifying with 50 to 70 points rated as Class B.
Schools qualifying below 50 points rated as Class C.

A. Schedule for grading Optometry Schools.

1. Faculty:

Number; qualifications (standing in profession, evidence of special training, teaching experience); proportion of time to teaching; organization, proportion of teachers to students.

2. Administration and Supervision:

Curriculum; completeness of course, sequence of studies. Faculty meetings. Entrance requirements, supervision of entrance requirements. Records; class grades, promotion of students, attendance of teachers and students, laboratory and clinical records. Hours required; class room, laboratory; clinical work.

3. **Buildings and Equipment:**

   Building or space occupied including class rooms, laboratories and clinical rooms. Quantity and variety of laboratory equipment. Quantity and variety clinical material. Apparatus. Funds: Students' fees, endowments, scholarships.

4. **Product:**

   Qualifications of students admitted, student organization; records of graduates before State Boards; research work; records of graduates as teachers; membership in optometric organizations; reputation in profession, reputation of school.

ESSENTIALS OF AN ACCEPTABLE OPTOMETRY SCHOOL OR COLLEGE.

Preliminary Educational Requirements

1. Minimum requirements for admission to Class A Optometry College is a four year high school education or its full equivalent as determined below.
   (a) Matriculant shall have completed a four year course of at least fifteen units in an accredited high school or secondary school or have the equivalent as determined by examination to be conducted by the authorized examiner of a standard college or university approved by the Council on Optometric Education or by a State Examining Board.
   (b) Credits for admission to any optometry school may be granted for the subjects shown in the following list and for any other subject counted by an accredited high school or secondary school, provided that at least ten units must be offered in Groups 1-5. Nine units are required as indicated. The balance of the 15 units may be made up from any of the other subjects in the schedule.

Schedule of Subjects Required or Accepted for Entrance to Class A Optometry School.

SUBJECTS:

	*Units**	*Required*
Group 1 — English		
Literature, composition	3-4	3
Group 2 — Foreign Languages		
Latin	1-4	
Greek	1-3	1
French or German	1-4	
Spanish or Italian	1-4	
Group 3 — Mathematics		
Elementary Algebra	1	1
Advanced Algebra	½-1	
Plane Geometry	1	1
Solid Geometry	½-1	
Trigonometry	½-1	
Freehand or Mechanical Drawing	1	1

Subjects (Continued)

	*Units**	*Required*
Group 4 — History		
Ancient History	½-1	
Mediaeval and Modern History	½-1	
English History	½-1	1
American History	½-1	
Civil Government	½-1	
Group 5 — Science		
Botany	½-1	
Zoology	½-1	
Chemistry	½-1	
Physics	½-2	
Physiography	½-1	
Physiology	½-2	1
Astronomy	½	
Geology	½-1	
Group 6 — Miscellaneous		
Agriculture	½-1	
Bookkeeping	½-1	
Business Law	½-1	
Commercial Geography	½-1	
Domestic Science	½-1	
Economics and Economic History	½-1	
Manual Training	½-1	
Music	½-1	

* A unit is the credit value of at least thirty-six weeks' work of four or five recitation periods per week, each recitation period to be not less than forty minutes.

2. The Optometry School:

A. Administration:

1. There shall be an authorized Entrance Committee to pass upon the student's preliminary educational qualifications and credentials. All affidavits or documentary evidence of the student's preliminary education shall be kept on file and open for inspection.
2. Students shall be required to be in actual attendance in the school within the first week of each annual session and thereafter. Actual attendance at classes shall be required except for good cause and credit shall not be given for any course where the attendance has been less than 80% of the full time; to be determined by a Committee on Course and Standing.

3. There shall be thorough supervision of the entire school by the dean or other executive who is given sufficient authority to carry out the rules and regulations laid down by the governing board of the school.

4. There shall be a complete system of records in charge of a recorder, showing the credentials, attendance, grades and accounts of the students so that an exact knowledge may be obtained of each student's work. These records shall also show the attendance, time spent and work done in laboratory and clinic.

B. The school curriculum shall cover a two year course of at least thirty-two weeks in each school year, exclusive of time required for marticulation and holidays and not less than 18 nor more than 25 hours of actual class-room work per week. The course in the various subjects shall be sufficiently comprehensive to carry out the ideals of optometric education as determined by the present day knowledge of optometry and shall be set forth in the annual announcement, showing for each course its subject, content, character, (lecture, recitation, laboratory or clinic) length of time, when, where and by whom given and the manner of giving credit. The two year course shall include thorough training in the following subjects: General Anatomy, General Physiology, Mathematics, Physics, Physiologic Optics, Ocular Anatomy, Ocular Pathology, Theoretic Optics, Practical Optics, Theoretic Optometry, Practical Optometry, Hygiene and Psychology, together with intensive laboratory and clinical work. There shall be required a minimum of 100 hours actual clinical work consisting of practical application of modern instruments and methods used in the practice of optometry.

C. Present day optometric knowledge makes it essential that the subjects taught be in charge of well trained teachers. The faculty shall be so organized that there shall be a teacher who shall be responsible for the instruction given in each department.

D. The school should maintain an adequately equipped laboratory for demonstration, experimental and research work. There shall be rooms completely equipped with instruments and apparatus

for optometric examinations and sufficient clinical material supplied.

E. The school shall also be supplied with such auxiliary apparatus as a stereopticon, carefully prepared charts, models, manikins and other necessary apparatus used in optometric teaching. There should be an optometric library which should include the modern text and reference books and optometric periodicals and it should have a librarian in charge.

F. A clear statement of the school's requirements for admission, tuition, time of attendance on the classes, sessions, courses offered and graduation shall be published in annual catalogues or announcements.

G. A complete list of names and addresses of all students entering an optometry school, as well as the names and addresses of all graduating, shall be forwarded to the Secretary of the Council of Optometric Education as promptly as possible after entering or graduating.

OUTLINE SYLLABUS ON THE ANATOMY AND PHYSIOLOGY OF THE EYE.

Preamble.

It is recommended that every optometry student should have a fundamental knowledge of general anatomy and physiology of the human body before taking up so specialized a subject as the anatomy and physiology of the eye. To study a special part of the body without having had any course of study in the general subject does not seem to be either good pedagogics nor sound scientific procedure, neither does it prepare a student for a better understanding and clearer comprehension of the special part to be studied. One of the criticisms often offered optometrists is that they have not had sufficient elementary work in the general anatomy and physiology of the body. Such a criticism is very properly merited. Therefore, the following brief outline is suggested as an irreducible minimum.

General Anatomy and Physiology.

1. Cell:

Structure; ameba; function and functioning of cell; kinds of cell; food supply and waste elimination; relation of cell to tissues; need for work and for rest.

2. Nervous Systems:

Locations and names of all parts of the cerebro-spinal system and the autonymic system; their relations; structures and kinds of tissue; the neuron, kinds of nerves; reflex action; the domination of these systems in their relation to other parts and organs of the body.

3. Bones:

Kinds of bones; histology of bones; function of bones; names and location of bones of trunk, upper and lower extremities; joints.

4. Muscles:

Kinds of muscles; histology and examples of different kinds; function; gross action of the larger muscles of the body, and the names and location of those muscles; nutrition and waste, exercise and rest.

5. **Blood Circulatory System:**

Physical and chemical properties and composition; kinds of corpuscles and their function; carrier of waste and nutrition; Heart, arteries, veins and capillaries, their structure and function; pulmonary, systemic, portal and gastric and intestinal circulations; relation to lymph circulation and to the respiratory tract.

6. **Lymph System:**

Physical and chemical properties; origin and structure of vessels and nodes; their functions; location of vessels, nodes and ducts; function of white corpuscle; lacteal vessels, location and function; relation between blood and lymph.

7. **Respiratory Tract:**

Gross structure and names of all parts; histology of lungs; mechanics of respiration; function of respiration; relation of respiratory rate to heart rate; epithelial coverings and linings; discussion of the need of fresh, clean, pure air.

8. **Digestive Tract:**

Names, location, position, and structure of all parts including the accessory organs; teeth, salivary glands, and digestive juices; digestion of proteids, carbohydrates and fats; mixed diets; hygiene of the tract.

9. **Genito-Urinary Tract:**

Structure and location of all parts; histology of kidney tissue; method of waste elimination from blood; relation of over-eating, over exercising, and insufficient drinking of water, supra-renal glands.

10. **Glands and other organs:**

Ear, spleen, liver, etc.; their location, general structure and functions.

11. **Books recommended:**

Human Mechanism, Hough & Sedgewick; Lessons in Elementary Physiology, Huxley & Lee; Human Physiology, Martin; Hygiene the Optometrist ought to know, Woll.

ANATOMY AND PHYSIOLOGY OF THE EYE.

1. **Embryology of the Eye:**

The optometrist should be equipped with not only a fundamental knowledge but a detailed knowledge of the eye, and, therefore, it is desirable

to have a very thorough study of the eye beginning with its embryology. It should include the following at least:

The spermatozoa; the ovum; the method of fertilization; the segmentation or cell division of the ovum, the morula; the development of the endoderm, ectoderm, and mesoderm; the names of those parts of the eye and the orbit which develop from those three coverings; primitive streak and medullary groove; primary brain vesicle, secondary vesicle, etc., to the first appearance of the primary optic vesicles; follow the development of those vesicles; the "anlage" of the lens; the invagination of the primary vesicle; the formation of the second and third optical vesicles; embryology of the retina and choroid, choroidal fissure; the lens, humors, blood-vessels, iris, cornea sclerotic and muscles; eyelids, and cilia; adhesion of eyelids in lower animals for sometime after birth.

Books recommended: Any book on embryology.

2. Accessories of the Eye:

Eye-brows, anatomy and function; in lower animals, in human beings.

Eye-lids, covering, lining, muscles, glands, cilia, action, and function. Canthi and the fornices of the conjunctiva. Relation of palpebral conjunctiva to ocular conjunctiva, the structure and the function. Caruncle lacrimalis, lakus lacrimalis, plica semilunaris, and membrana nictitans.

C. *Lachrymal apparatus*; Lacrimal gland, accessory gland, ducts, canals, sac, nasal duct, lakus,—structure, location, function, and relationships. Use sketches.

D. *Extrinsic muscles*; These are sometimes regarded as accessories to the organ of vision. It is optional to teach them in that capacity. Their names, number, location, origin, insertion, nerve supply, blood supply, form, action, relation to intrinsic muscles, relation to Tenon's capsule, histology. There must be included here the muscles of the eyelids, their location, action, blood supply and nerve supply. If those muscles are discussed and taught under eye-lids, they would, of course, be omitted here. Optional: Corrugator superclii, tensor tarsi, and internal tarsal ligament. Use sketches

3. Orbit:

A. *General description*; This must include the names of the orbital bones and their locations. The general description of the orbits as pyramidal cavities.

B. *Detailed description* of walls, angles, base, apex, axes, fissures, openings, and foramina.

4. Eye:

A. *The tissues surrounding the eye*; Tenon's capsule, relation to muscle sheaths and conjunctival fornices. Lymph spaces, adipose tissue, check ligaments, suspensory ligament of the eye.

B. *Planes, points, axes, meridians*; These may and sometimes are taught under physiologic optics. They have a proper place under that caption. However, they are mentioned here for the purpose of calling attention to certain anatomic positions, as for example, muscle plane, axis of turning of a muscle, anterior-posterior positions and the like. The student should be taught to speak the language of the anatomist and physiologist. Such terms as "front," "back," "top," "bottom," and similar terms have very gross inaccuracies in their meaning when used in connection with the anatomy and physiology of the body or of specific parts of the body. Under this division should be included the difference in the axes of the eyes and the axes of the orbits, the various diameter lengths of the eye, and the nodal points.

5. First coat of Eye:

A. *Cornea and Sclerotic*; Structure,— gross anatomy and histology of both tissues, their nutritive supply and their elimination of wastes (blood supply or lymph supply), their coverings, linings, attachments, and relationships. Names, and locations of entering vessels and nerves. Peculiarity of structure through which those vessels and nerves pass. Lymph spaces and anatomic connection of the brain coverings with the sclera. Function of cornea and of sclerotic.

6. Second coat of the Eye:

A. *Choroid, ciliary body, and iris*; The structure of each, gross and microscopic. The layers of each and their function. Blood-vessels and relationships to other tissues and connections with other

vessels. The detail of the anatomy and physiology of the ciliary body and all its parts is regarded as extremely essential. The blood-vessels and nerves of the iris and their ramifications.

7. Third coat of the Eye:

A. *Retina:* Gross anatomy and histology. The function of its parts as well as their names. The anatomic relationships with other surrounding tissues.

B. *Special parts* of the retina in detail, i. e., yellow spot, fovea, optic cup, optic papilla, optic disk, and ora serrata, etc. A discussion of daylight and twilight vision, color vision, color vision theories, and the physiology of vision in general. Blood-vessels in detail.

8. Humors:

A. *Aqueous:* Chemical composition and physical properties. Location,— anterior and posterior chambers. Its origin, or source of supply, its course, its final drainage into the blood stream. Function.

B. *Vitreous:* Chemical composition and physical properties. Anatomical construction and physiologic function. Hyaloid membrane and its ramifications, relationships, attachments such as the zone of Zinn, canal of Petit, suspensory ligament. Its nutrition.

9. Lens:

A. *Structure of lens:* Its anatomical structure, and relationships. Its function. Accommodation and the theories advanced. The capsule and its attachments. Nutrition.

B. *Poles and equator:* Their location. Nodal points.

C. *Age:* The lens in the fetus, in youth, in early and advanced age.

D. *Effect of drugs.* This should not be more than a statement. The discussion may be left for either physiologic optics or pathology of the eye.

10. Optic Nerve:

A. *In detail:* Histology of the nerve, including the discussion of the axis cylinders, coverings, and the making of a nerve trunk. It should include a study of the chiasm in detail, its fibres especially. The ramifications of the optic nerve to show the relation of the sense of vision to other senses. Re-

lation of optic nerve to the nerves which govern the extrinsic and intrinsic muscles of the eye. Locate the optic radiation, primary optic and secondary optic centres, optic and the Gudden's commissures, quadrigeminal bodies, optic thalamus, and the origin of the nerves that feed the muscles of the eye.

11. Blood-vessels:

A. It would be well that all students should be thoroughly instructed in the general blood and lymph circulation of the body. It would be easy then to teach the circulation from the heart to the eye and return. Merely studying the course of blood through the eye without having a knowledge of where it goes after it leaves the eye, or knowing from where it comes before it reaches the eye is not at all to be regarded as thorough. It is, therefore, recommended that the blood circulation, both arterial and venal, be a matter of detail instruction. It is optional to teach the subject as a separate division or to teach it as the different parts of the eye are considered. It would seem wise, however, to have the matter presented toward the last of the course as a summary of the circulation.

12. Nerves:

It is suggested that the nerve supply of the eye should be studied in much the same way that has been suggested for the study of the circulation. The student ought to know what the relationships of the ocular nerves are to the central system and to the automatic system. The location of all specific and related plexi and ganglia should be a matter for thorough teaching.

13. Dissections:

It must be obvious that any kind of anatomy and physiology can only be thoroughly taught and mastered if there is ample dissection. The old fashioned way of having one eye dissected by the instructor while the students look on is not only wholly inadequate but futile in the attempt to teach the subject. Every student should be required to make a general dissection under direction first. That should then be followed by the student being required to make at least the following dissections and submit them to the instructor for

criticism and quizzing: Anterior half showing all parts *in situ*, the lens removed, the remains of the choroid and processes removed, the posterior half with all parts *in situ*, the retina removed, the choroid removed, a sagittal section all parts *in situ*, the lens removed, the retina removed, the choroid removed, a complete lens, a meridional section, a choroid, a retina, a split optic nerve. Optional specimens: a hyaloid membrane with all attachments and its contents, the extrinsic muscles, cross section of the cornea with part of the sclerotic attachment, a whole iris, a section of the iris and such other dissections as the instructor would regard as of value in the teaching of his subject.

14. Sketches:

Sketches are always of value. Many times a very rough sketch is of more value than a beautiful and colored schematic chart. The sketch is in the possession of the student and usable by him at all times. The chart is the property of the school and is only of a temporary use to the student. Sketches made from actual dissections and properly labeled are always of great utility to the student. In fact it is hoped that some time soon it will be possible for the State Board of Optometry Examiners to call for note books in this subject.

15. Preparation of Eyes for dissection:

A. The eyes of cattle are the best so far as size is concerned. The pig's eye, is, of course, more like the human eye. The cattle eye, however, is to be recommended because relationships can be seen so much more easily. The eyes as soon as they are procured from the slaughter house should be placed in a 5% solution of formaldehyde and left in it for about twenty-four hours. The eyes should be completely covered and stirred regularly so that they will not rest too long in one position. At the end of that time they should be removed and all of the outside tissues cut away. When the eyes are thoroughly cleaned they are then to be placed in a 10% solution of formaldehyde and left there for at least two weeks. During that time they should be stirred about several times so they will not be too long in one position and perhaps be put out of shape.

Dissecting instruments for the eye should include

one pair of tweezers, a pair of small scissors with one blunt jaw and one pointed jaw, a safety razor blade and some jars of the vaseline jar type. All specimens may be indefinitely preserved by students if they are placed in a 5% or 8% solution of formaldehyde.

16. Text Books:

For a course in the anatomy and physiology of the eye it is recommended that the following text books are valuable: Gray's Anatomy; Quains Anatomy; Gerrish's Anatomy; Howell's Physiology; Anatomy and Histology of the Eye-ball, Salzman; Embryology, Anatomy and Physiology of the Eye, Brown & Zoethout; Technique of Eye Dissections, Woll; Hirschfeld's Anatomy of the Eye (plates and explanation).

OUTLINE SYLLABUS ON THEORETIC OPTOMETRY

Preamble.

A course in theoretic optometry should be divided into at least (1) an elementary course and (2) an advanced course. First, such a division will give an opportunity to familiarize the student with (A) the history of optics and optometry. (B) Scope of optometry. (C) Ophthalmic lenses. (D) The nomenclature of optometry. (E) Test charts. (F) Test or Trial lenses. (G) Instruments, their names, and general use.

Second, The advanced course should be organized to cover fully and thoroughly (A) All theories, systems, and methods of correcting all kinds of errors of ocular refraction. (B) The detail of theory involved in correcting muscular imbalances. (C) The relation between muscular imbalances and errors of ocular refraction. (D) The detail of instruments in their theoretic relationships to the eye and its accessories. (E) The value of objective optometry. (F) The value of subjective optometry. (G) The relation between objective and subjective optometry. (H) Examination blanks. (I) Equipment, necessary and advisable.

It is quite probable that some of the subjects here listed may be included elsewhere under such subjects as practical optics, practical optometry, or physiologic optics. It is, of course, difficult to draw a real sharp line of demarcation because opinions vary and differ. Physiologic optics is often confounded with theoretic optometry and many state board examiners place pure physiologic optics questions in their theoretic optometry question papers. Perhaps at some later time optometrists will come to the conclusion that physiologic optics and theoretic optometry are closely enough allied to place the two subjects under one caption. It is difficult to say at this time whether or not that caption should be physiologic optics or theoretic optometry.

However, a course of study in the theory of optometry should not be a difficult matter to conceive. Theory always concerns itself with ideas, beliefs, abstract principles, and systems. It does not concern itself in the results of the practical application. The theory of the fogging system is far from the judgment one would use in prescribing lenses through the results obtained by the use of the fogging system, and so on. If this presentation is kept in mind both the student and the teacher will then be clearer in their work, in their preparation, and in their course of study.

It may be well to state here that the history has been added to this syllabus for the reason that every practitioner in opto-

metry ought to know something of the history, development, and evolution of his chosen profession. It seems right and proper that each student should know what has been accomplished by those who have preceded him in his profession. He should be given in addition a full measure of the ideals of those who have labored hard to bring into being a profession that is rendering a real service to mankind. Only too many practitioners in all professions feel that they have but one object and that is monetary return for service given. It is hoped that the brief history suggested in this syllabus will go a little way at least toward preventing pure avaraciousness on the part of the coming optometrists. Theoretic optometry may not be the best place in which to place the history. At present it seems to be the only place. At a later time and when the course of study is increased there may be found a place for a one term course of study of the history of optics and optometry.

1. Elementary Theoretic Optometry:

A. History:

(a) Ancient belief regarding vision as due to something emanating from the eye. Keplers discovery of light coming from object to the eye. Lucretius, 100 B. C., theory of "simulcra." The works of Euclid, Pliny, Seneca, and Al Hazan.

(b) About time of the Middle Ages. The works, theories and discoveries of Porta, Lipperschey, Galileo, Kepler, Snellen, Drehelius, and Descartes, together with Bartolinius, Newton, Roemer, Bradley, and Huyghens.

(c) More modern times. The work, theories, and accomplishments of Hall, Dollond, Young, Fresnel, Maxwell, Rayleigh, Kelvin, Brewster, Schultze, Donders, Landolt, Molus, Leeuwenhoek, Arago, Biot, Faraday, Nicol, Wollaston, Frauenhofer, Scheeler, Daguerre, Talbot, Gauss, Listing, Chance, Schott, Maudsley, Whitworth, Babbage, Liebrich, Bowman, Fitzgerald, Helmholtz, Javal, Schiotz, Gullstrand, Von Rohr, Whitwell.

Reference: A very valuable publication by Bausch & Lomb.

(d) Evolution of optometry as a science and separate profession. The change from optician to refractionist, refracting optician, specialist in lenses for the eye, and so on to the present optometry and optometrist. The struggle for recognition. Difficulty of laws. The great variation of our laws. A presentation of the noble heritage of the ages

passed to the student to carry onward and upward. Give names of men prominent in the uplift of optometry. Prentice and his "Ophthalmic Lenses" and system of measuring prisms. Cross and his dynamic skiametry. The names of those who have been presidents of the A. O. A. The history of our schools of optometry. The future of optometry.

B. Scope of Optometry:

Relation of optometry to other professions, as for example, the general practitioner of medicine, the oculist, the dentist, and the illuminating engineer. The work to be done in the conservation of vision. Defective eyes are not the only ones which need the attention of the optometrist who is really an eyesight specialist.

C. Ophthalmic Lenses:

(a) A description combined with sketches of all kinds of lenses beginning with the plano-convex and plano-concave through to the so-called toric lens of modern times. In addition discuss the "Punktal" and the "Katral" lenses, and the Wellsworth corrected lens series. Define the word lens from the standpoint of the optometrist. Define the word prism from the standpoint of the optometrist.

(b) A definition of the use of the word periscopic as used in optometry. The meaning of "deep meniscus," "shallow meniscus" and "base curve." There should be included also a discussion of the advantage of the various forms of the lenses, as, for example, the toric lens as compared with the so-called "flat" lens.

(c) Numbering of lenses,— old system and the new system. The numbering of prisms,— the old system and the new or Prentice' system. Dennet's system of numbering prisms.

(d) Bi-focal lenses. Begin with the demonstration of the split bifocal to a demonstration of the one-piece bifocal of today. The theoretic advantage and theoretic disadvantage of bi-focals. The bicentric and the monocentric.

D. The Nomenclature of Optometry:

(a) The definition and meaning of terms in daily use. Such, for example, as emmetropia, hyperopia, myopia, astigmia, ametropia, heterophoria, heterotropia, muscular imbalances, and so on. Where

ever possible these should be illustrated by sketch.
Reference: Lewis Ophthalmic Dictionary.

E. Test Charts:

(a) The infinity distance of the optometrist. Effect on accommodation when object is brought within that distance. Chart for twenty-foot room; for ten-foot room. The use of mirror.

(b) Snellen's test letters. The optometric use of the "Angle of five minutes." Usable and unusable letters. Samples of the great variety of test cards in use should be shown, discussed, and critically examined. The law of irradiation affecting the letters used. Illiterate test charts. Reading test charts. The advantage of phonetically spelled words. Consideration of the different kinds of holders.

(c) Astigmatic test charts. A comparison of the various kinds. Compare the lines for astigmia tests with the letters for astigmia tests.

(d) Test chart cabinets. Wooden ones and metal ones. General mechanism. Use and convenience. The glass test chart. Illumination of test charts. The Ives test cabinet and other forms of test charts and letters.

F. Test or Trial Lenses:

(a) The office case. In wood, in leather, or other kind of finish. The test case roll-top cabinet. The metal cabinet or so-called "sanitary test case" or "cabinet." The traveling case. Other forms of test or trial lens containers.

(b) Trial lenses. A full explanation of the number and kinds of each of spheres, cylinders and prisms. Auxilliary discs. Critically discuss the trial lens frames and handles and also the marking of the cylinders. The vertex refraction trial lenses and effective power trial lenses.

G. Instruments:

(a) Subjective instruments. Simple explanation and demonstration of use of all kinds and forms of optometers from the early optometer, punctometer and refractometer to the modern instrument of today. Explanation in full of their principles, their advantages and disadvantages.

(b) Objective instruments. Simple explanation of various kinds of ophthalmometers, ophthalmo-

scopes and skiascopes. A discussion of their principles, their development, their advantages and disadvantages. Demonstration of the instruments.

2. Advanced Theoretic Optometry:

A. Static Optometry:

(a) Objective static optometry. (Muscles relaxed.) Exact definition. Its use in general cases and in specific cases. Regarded as a means of finding, aiding in decisions, and in checking up other results. An enumeration of the various kinds of objective examinations and the instruments used. Conditions necessary for its operation.

(b The theory of static skiascopy in detail. Explain principle. Use sketches. The theory of ophthalmoscopy, direct and indirect. The optics involved should be shown by sketches. Other instruments. Conditions necessary for its best results.

(c) Subjective static optometry. (Muscles relaxed.) Exact definition. This should include a compilation of instruments and methods used in estimating errors of refraction, statements of principles, and comparisons. The conditions that are necessary for its proper practice.

B. Dynamic Optometry:

(a) Objective dynamic optometry. Exact definition. Its use in general cases and in specific cases. Its relation to static optometry. Its value as a means of estimating the kind and the amount of error independent of the intelligence of the patient. Errors to avoid. Apparatus to be used.

(b) Dynamic skiametry. Its theory must be taught in detail. Sketches should be used for the purpose of fixing the optics involved. Compare with static skiametry. Work with small and large mirrors. Fixation points, etc. Other instruments. The best conditions under which the best results will be obtained. Use of drugs.

(c) Subjective dynamic optometry. An exact definition. Its usefulness. As an aid to judgment. As a final test. Compare with the other methods or systems. Include a compilation of instruments, methods used, statement of various principles, and comparison of methods. The conditions necessary in order to obtain the best results.

C. Theories of Systems and Methods Used in Correcting Errors of Ocular Refraction:

(a) Kinds of errors:

Hyperopia. Its etiology and characteristics. Kinds of hyperopia. The various tests, as for example, fogging system. Judgment to be used. The relation of the error and its correction, to various occupations. Relation of hyperopia to temperament. The possible reflexes from uncorrected hyperopia. Its relation to other kinds or errors of refraction of the eye and muscular imbalances. Its relation to general health.

Myopia. Its etiology, characteristics, and development. Kinds of myopia. Various tests, correction. Relation to age and occupation. The judgment to be used. Reflexes. Relation to other kinds of errors of refraction of the eye. Relation of the error to temperament. Relation to muscular imbalances. Relation to constant close application. Theory of surgical treatment.

Astigmatism. Its etiology and characteristics. Kinds of astigmatism. Astigmatism and hyperopia. Astigmatism and myopia. So-called mixed astigmatism. Methods and systems of correction. Relation to muscle imbalances. Relation to presbyopia. Relation to health. Various reflexes. Judgment to be used. Relation to temperament.

Presbyopia. Its etiology and characteristics. Age and occupation. Relation to other errors of refraction of the eye and muscle anomalies. Consideration of presbyopia, temperament and health. General reflexes. Judgment to be used. Methods and systems of correction.

Muscle anomalies. Etiology and characteristics. Kinds of anomalies with emphasis on nomenclature and general terminology. Methods, systems, and tests for correction. Relation to temperament, to health, and to the different errors of ocular refraction. Theory of advancement and tenotomies. Review of innervation of muscles. Conditions of age.

(b) Examination blanks: The value of keeping accurate records. Exhibition and criticism of different blanks from the standpoint of their thoroughness and their utility. The arrangement of the

blank from the standpoint of procedure of the examination and future reference.

(c) Equipment: The instruments that are necessary and those that are advisable. Location of instruments. Suggestions relative to constructions of dark or examining-room. Wash-basin. Mirror, comb, brush, assortment of pins, etc., for convenience of patients. The waiting room,— wall colorings, decorations, use of good pictures, the place for diplomas and license. Literature for waiting room. Adjusting tables. The value of a professional atmosphere.

OUTLINE SYLLABUS ON THEORETIC OPTICS.

Preamble.

This course should be based upon a very comprehensive understanding of at least elementary algebra and also plane geometry and trigonometry. In fact those studies should be regarded not only as essential but as prerequisites to this course. Further, it is recommended that a course in elementary physics be taken as an introduction to theoretic optics, for the rather obvious reason that physics and theoretic optics are rather inseparable. Or, to put the matter in another way, theoretic optics is an essential part of physics. Therefore, a general knowledge of physics becomes a general preparation for theoretic optics.

This syllabus is largely based on "Mirrors, Prisms, Lenses," by Southall and "Light for the Student" by Edser.

The course may conveniently be divided into (1) Elementary, and (2) Advanced. However, it is not intended to restrict the course to these two divisions. They may be otherwise or further divided. That is left entirely to the judgment of the teacher.

Also the work with experiments may easily be made to cover a period of four terms. However, that, too, must be left to the teacher.

The elementary course should include:

(A) Definitions.
(B) Simple reflection of light.
(C) Simple refraction of light.
(D) Use of smoke box.

The advanced course should include:

(A) Reflection.
(B) Refraction at plane surfaces.
(C) Prisms.
(D) Refraction at spherical surfaces.
(E) Thin lenses (and fixed lenses).
(F) Curvature, etc.
(G) Astigmatic lenses.
(H) Geometric theory of the Symmetrical Optical Instrument.
(I) Compound systems. Thick lenses and combinations of lenses and mirrors.
(J) Aperture and Field of Optical System.
(K) Dispersion and Achromatism.
(L) Rays of finite slope. Spherical aberration, Astigmatism of oblique bundles.
(M) Polarization and Double Refraction.

In addition to the above it is suggested that a parallel laboratory course of about two dozen experiments be given to impress upon the student the application of the above topics.

ELEMENTARY COURSE.

(A) Definitions:

A scientific definition of such terms as light, luminous bodies, transparent, translucent and opaque bodies. The meaning of umbra and penumbra, reflection, refraction, dispersion and achromatism, polarization. Differentiation between ray, beams, and pencil of light. The meaning of normal, incidence, real and virtual images, focus, conjugate foci, absolute and relative index, mirror, prism, lens, etc., etc.

(B) Reflection of light:

(a) Differentiation between regular and diffused reflection.
(b) Law of reflection.
(c) Image in plane mirror.

(C) Refraction of light:

(a) Passage of light from one medium to another.
(b) Law of refraction — Snell's.
(c) Limiting values of the index of refraction.
(d) Reversibility of the light path.
(e) Absolute and relative index of refraction.
(f) Construction of refracted ray.
(g) Deviation of refracted ray.
(h) Total reflection (critical angle).
(i) Interference.
(j) Absorption.

ADVANCED COURSE.

(A) Reflection:

(a) Field view of a plane mirror.
(b) Successive reflections from two plane mirrors.
(c) Images in a system of two inclined mirrors.
(d) Applications of the plane mirror — porte lumiere, heliostat, sextant.
(e) Reflection of paraxial rays at a spherical mirror.
(f) Focal point and focal length of a spherical mirror.
(g) Graphical methods of exhibiting the imagery by paraxial rays in curved mirrors.
(h) Extra-axial conjugate points.
(i) Lateral magnification.
(j) Field of view of a spherical mirror.

(B) Refraction at plane surfaces:

(a) Trigonometrical calculation of ray refracted at a plane surface.
(b) Imagery in a plane refracting surface by rays which meet the surface nearly normally.
(c) Path of a ray refracted through a slab with plane parallel sides.
(d) Apparent position of an object seen through a transparent slab whose parallel sides are perpendicular to the line of sight.
(e) Multiple images in the two parallel faces of a plate glass mirror.

(C) Prisms:

(a) Construction of path of a ray through a prism.
(b) The deviation of a ray by a prism.
(c) Grazing incidence and grazing emergence.
(d) Minimum deviation.
(e) Deviation away from the edge of the prism.
(f) Trigonometrical calculation of the path of a ray in a principal section of a prism.
(g) Total reflection at the second face of a prism.
(h) Case when the ray tranverses the prism symmetrically.
(i) Deviation of ray by a thin prism.
(j) Power of an ophthalmic prism. Centrad and prism dioptry.
(k) Position and power of a resultant prism equivalent to two thin prisms.

(D) Refraction at Spherical Surfaces:

(a) Refraction of paraxial rays at a spherical surface.
(b) Reflection considered as a special case of refraction.
(c) Construction of conjugate axial points.
(d) The focal points of a spherical refracting surface.
(e) Abscissa-equation referred to the vertex of the spherical refracting surface as origin.
(f) The focal lengths of a spherical refracting surface.
(g) Extra-axial conjugate points; conjugate planes of a spherical refracting surface.
(h) Construction of extra-axial conjugate points with respect to a spherical refracting surface.
(i) Lateral magnification for case of a spherical refracting surface.
(j) The focal planes of a spherical refracting surface.
(k) Image equations in the case of refraction of par-

axial rays at a spherical surface. Newtonian formula.

(l) The so-called Smith-Helmholtz formula.

(E) Thin lenses:

(a) Forms of lenses.
(b) The optical center of a lens surrounded by the same medium on both sides.
(c) The abscissa-formula of a thin lens referred to the axial point of the lens as origin.
(d) The focal points of an infinitely thin lens.
(e) Construction of axial conjugate points.
(f) Extra-axial conjugate points. Conjugate planes.
(g) Lateral magnification in case of infinitely thin lens.
(h) Character of the imagery in a thin lens.
(i) The focal lengths of an infinitely thin lens.
(j) Field of view of an infinitely thin lens.

(F) Curvature, etc.:

(a) Curvature and its measure.
(b) Reduced distance.
(c) The refracting power.
(d) Reduced abscissa and reduced vergence.
(e) The dioptry as unit of curvature.
(f) Lens gauge.
(g) Refraction of paraxial rays through a thin lens system.
(h) Prismatic power of a thin lens.

(G) Astigmatic lenses:

(a) Curvature and refracting power of a normal section of a curved refracting surface.
(b) Surfaces of revolution — cylindrical and toric surfaces.
(c) Refraction of a narrow bundle or rays incident normally on a cylindrical refracting surface.
(d) Thin cylindrical and toric lenses.
(e) Transposing of cylindrical lenses.
(f) Obliquely crossed cylinders

(H) Geometrical Theory of the Symmetrical Optical Instrument.

(a) Graphic method of tracing the path of a paraxial ray through a centered system of spherical refracting surfaces.
(b) Calculation of the path of a paraxial ray through a centered system of spherical refracting surfaces.
(c) The so-called Cardinal Points of an optical system.

(d) Construction of the image point conjugate to an extra-axial object point.
(e) Construction of the nodal points.
(f) The focal lengths.
(g) The image equations in the case of a symmetrical optical system.
(h) The magnification-ratios and their mutual relations.

(I) Compound Systems. Thick lenses and combinations of lenses and mirrors:

(a) Formulae for combination of two optical systems.
(b) Formulae for combination of two optical systems in terms of the refracting power.
(c) Thick lenses bounded by spherical surfaces.
(d) The so-called "Vertex" refraction of a thick lens.
(e) Combination of two lenses.
(f) Combination of three optical systems.
(g) Thick mirror.

(J) Aperture and Field of Optical System:

(a) Limitation of ray-bundles by diaphragms or stops.
(b) The aperture-stop and the pupils of the system.
(c) Aperture-angle. Case of two or more entrance pupils.
(d) Field of view.
(e) Field of view of system of a thin lens and the eye.
(f) The chief rays.
(g) The so-called "Blur Circles" (or circles of diffusion) in the screen plane.
(h) The pupil centers as centers of perspective of object space and image space.
(i) Proper distance of viewing a photograph.
(j) Perspective elongation of image.
(k) Teleocentric systems.

(K) Dispersion and Achromatism:

(a) Dispersion by a prism—Newton—Wollaston.
(b) Dark lines of the solar spectrum—Frauenhofer.
(c) Relation between the color of the light and the frequency of vibration of the light waves.
(d) Index of refraction as a function of the wave length.
(e) Irrationality of dispersion.
(f) Dispersive power of a medium.
(g) Chromatic aberration and achromatism.
(h) "Optical Achromatism" and "Actinic Achromatism."

(i) Achromatic combination of two thin prisms.
(j) Direct vision combination.
(k) Calculation of Amici prism with finite angles.
(l) Achromatic combination of two thin lenses.
(m) Achromatic combinations of two thin lenses in contact.

(L) Rays of finite slope. Spherical aberration, Astigmatism of oblique bundles.

(a) Construction of a ray refracted at a spherical surface — Young's constructions.
(b) The aplanatic points of a spherical refracting surface.
(c) Spherical aberration along the axis.
(d) Zoherical zones.
(e) Trigonometric calculation of a ray refracted at a spherical surface.
(f) The sine-condition or condition of aplanatism.
(g) Caustic surfaces.
(h) Meridian and sagittal sections of a narrow bundle of rays before and after refraction at a spherical surface.
(i) Formula for locating the position of the image point of a pencil of sagittal rays refracted at a spherical surface.
(j) Position of the image-point of a pencil of meridian rays refracted at a spherical surface.
(k) Image-lines (or focal lines) of a narrow astigmatic bundle of rays (Sturn's Conoid).
(l) The astigmatic image surfaces.
(m) Curvature of the image.
(n) Distortion; condition of orthoscopy.
(o) Seidel's theory of the five aberrations.

(M) Polarization and Double Refraction:

(a) Polarization by tourmaline and quartz.
(b) Direction of vibrations.
(c) Nature of polarized light.
(d) Polarization by reflection and refraction.
(e) Brewster's Law.
(f) Plane of polarization.
(g) Polarization by fine particles.
(h) Polarization by doubles refraction.
(i) The double image prism of Fresnel.
(j) Nicol's prism.
(k) The wave surface in Iceland Spar — Huygen's theory.

(l) Explanation of double refraction.
(m) Rotation of plane of polarization.
(n) Rotation by liquids.
(o) Colors from crystal plates in polarized light.
(p) Circular and elliptical polarized light.
(q) Production of colors by polarized light.
(r) Polarization figures with convergent light. Explanation of a polariscope.

OUTLINE SYLLABUS OF PRACTICAL OPTOMETRY

Preamble.

A course in practical optometry must of necessity run parallel to a course in theoretic optometry. While the one discusses principles, methods, and the theory of instruments used in measuring the refraction of the eye and the power of its muscles, the other tests the soundness of the principles by application and the manipulation of instruments through trial and practises. In short, practical optometry may rightly be regarded as clinical practise, observation, and to some extent at least comparable to laboratory experimentation or practise. The course should, if possible, be so arranged that most of the practise periods of the students would be preceded by a period in theoretic optometry. In this respect it would not be possible to begin the work in practical optometry, however, until much of the elementary work in theoretic optometry had been completed. That would seem to indicate that the student would begin his practical optometry about one term after he had begun his theoretic optometry.

The student should be admonished to come to study fully prepared with the proper instruments. He should at least be supplied with a skiascope, schematic eye, and ophthalmoscope. Experience of teachers seems also to point out that it would be wise for each student to equip himself with a test case. Optometry schools have been rather lenient, too lenient, in permitting the student to try to get through a course in optometry with a minimum equipment. All students it is suggested should be required to equip themselves for their life work with the same thoroughness with which dental students are required to equip themselves almost the first day they enter their dental schools. No student in any course, anywhere, can be taught to have the same care and develop the same careful methods of handling equipment with school supply equipment that he would if he were handling his own. Early in his career he should be taught that optometry requires good tools and instruments, that borrowing is a curse, and, also that he had better not attempt an optometry course if he cannot afford to take the course in a proper and professional manner. The time to impress the student with the standards and ideals of the profession is when he takes his first lesson in optometry. To permit him to go through his course of training in any other way means that he will hurt his profession after he graduates. The suggestion is that he be hurt first.

The course at present should be organized to have at least two divisions, (1) an elementary course and (2) an advanced course. Some other division could, of course, be made but that must be left to each individual school. The elementary course should be divided to include both objective and subjective work of a simple nature. The advanced work should include objective and subjective work in examining clinical patients.

1. ELEMENTARY COURSE.

A. Objective work:

(a) Skiascope: Method of holding the instrument. Hand movement as over against body movement. Work with the schematic eye, spheres first, cylinders next and compounds next. Use large sized "iris" first then the medium sized next. Practise in recognizing the difference between a "shadow" indicating spherical error and one indicating astigmatic error. Practise with different intensities of light. Practise at different distances. It might also be well to use different sized and kinds of mirrors in order to give the student experimentation to prove theory relative to the best sized and kinds of mirrors to use. Geneva and similar instruments.

(b) Ophthalmoscope: Method of holding the instrument. Practising with a schematic eye learn appearance of fundus. It is suggested that the student first be permitted to hold the eye in his hand and later learn how to see the fundus with the eye resting on a shelf or holder. First the experiment should be with the eye at zero (Emmetropia?) and then with the eye regulated to give high and low degrees of error. It is also suggested that after practise with the schematic eye the student be given an opportunity to observe the fundus of the eye of some animal such as a beef, calf, or pig. Both the direct and the indirect method should be practised in all cases, different sized "irises" being used in order to cultivate keen discerning powers before going to a human eye. Retinoscope or skiascope instruments that have an ophthalmoscope part; Gullstrand ophthalmoscope.

(c) Ophthalmometers: Basic work with a Placido Disc. Practise with schematic eye first, then with human eye,— the students, of course, should be practising on each other and checked by the in-

structor. It is implied that as many different makes of ophthalmometers as possible be used in order to give the student a thorough training.

B. Subjective Work:

(a) History: The student should be given an opportunity to quiz other students in order to learn the proper method of recording the history of the patient and to note any peculiarities of countenance, temperament, posture. Age and occupation and peculiar needs. Previous recent illness, condition of teeth, sources of illumination. It is suggested that students pretend they are someone else and concoct histories in order to give one another practise in eliciting information and personal history.

(b) Visual Acuity: Students should be given an opportunity to take the visual acuity of one another in order to learn how to do it accurately and rapidly. For those wearing glasses visual acuity with and without glasses should be recorded. Visual acuity should be recorded with the aid of test cards and with the Ives instrument, if the latter is available. The visual acuity should also be taken with different kinds of test charts in order to show that there may be variation by reason of different letter arrangement. Different candle power illumination should also be used to give practical demonstration such difference will make.

(c) Trial Frames: The student should be given practise in adjusting various kinds of trial frames to other students' faces. The same kind of practise should be given in adjusting the various kinds of subjective instruments to the face of one another. All of these practises give the student an opportunity to overcome clumsiness and nervousness.

(d) Special discs: Practise in adjusting and using the pinhole disc, stenopaic slit, maddox rod, method of finding axis of lenses in the trial frame, use of cobalt glass (chromatic) test, and all other kinds of discs in use.

(e) Perimeters: Practise in the plotting of visual fields or so-called outside field with perimeters and similar instruments.

(f) Color test: Practise in testing the students in the class for color blindness.

2. ADVANCED COURSE.

A. Objective work:

(a) Skiascope: Correcting errors of students, using static tests and making necessary allowance for so-called working distance. Dynamic skiametry with the use of fixation and practise in making necessary allowances. The use of spherical lenses in the correction of all meridians with the transpositions. It is suggested that students make themselves artificially ametropic for the purpose of giving one another practise.

(b) Ophthalmoscope: Practise with direct and indirect method on the eyes of other students. Also practise with instruments for the purpose of making a correction. Use of the so-called oblique illumination. Also practise with the ophthalmoscope in its use as a corneal and iridal magnifier. Recording and sketching peculiarities of fundus, color, etc.

(c) Comparisons: Learn to compare the findings with the skiascope, ophthalmoscope and the ophthalmometer.

B. Subjective Work:

(a) Accommodation: Finding range of accommodation. Amplitude of accommodation,— with and without corrections.

(b) Duction: Practise with various methods and with various devices for detecting and measuring muscular insufficiencies. Here again the students should be given the opportunity to practise on each other and taught how to make accurate observation and an accurate record of their findings.

It is also suggested that students be given practical demonstration and practise in the conducting of muscle exercises with the different devices and by different methods.

(c) Amplitude of convergence.

C. Clinical Work:

In this division of the course the student is to receive the practical training which will give him the opportunity to use intelligently the facts, methods, system of procedure and correct observation which he has been taught in the earlier part of this course and other courses that have a direct bearing upon the practise of optometry. Under

supervision and advice he ought to be given the opportunity to practise and prescribe. Here he has practise in meeting patients, studying them and their eye-problems, and giving advice or listening to the advice that is given by the instructor or demonstrator.

In addition he should be taught the need for personal cleanliness, ease of operation, courtesy, and professional deportment and seriousness. The value of proper and neat attire is also important.

D. Face Measurements:

This work is also given in practical optics. It would seem, however, that it could be repeated here to advantage. Particular stress should be placed upon the best kind of frames or mountings for a given face, or for the best kinds of frames or mountings to be selected for those engaged in different occupations and for those who are young, middle aged, or old aged. Even complexion should be taken into consideration as well as the stout face, the thin face, the long face, etc., etc.

E. Records:

At no time should a student be permitted to make an uncomprehensive, illegible, unintelligable and incomplete record of any case. The minutest detail should not be omitted. The student should be fully and deeply impressed with the seriousness of his work as an optometrist. Further, he should be most lastingly impressed with the fact that his success, his reputation, as well as that of all optometrists is completely in his own hands.

OUTLINE SYLLABUS ON PRACTICAL OPTICS.

(Laboratory Optics)

Preamble.

The term Practical Optics does not seem to be exact enough to convey the real meaning of the term. Practical optics seems to be a term which would lead one to think that in this course of study there is an application of theoretic optics. The work carried on in a course termed Practical Optics is in common parlance nothing more or less than shop work — shop work practise plus the fitting and adjusting of spectacles and eye-glasses. Just what the exact term should be to be clearly descriptive of the training given in the course is difficult at the present time perhaps to settle; and so while Laboratory Optics might be an apt term which would indicate shop work, it might be interpreted to mean the work a student would do in a laboratory in his attempt to prove his theoretic optics. By far the better term is Mechanical Optics and it is hoped that both State Boards of Education and State Boards of Optometry Examiners will soon adopt that term.

This course is now given to cover from a year and a half to two years. It seems, however, that some day educational departments or other bodies whose powers it is to formulate proper professional courses will realize as the instructors in the subject already do, that the time now given is not wholly sufficient to properly and thoroughly give the student the practise nor the training that he needs.

Below the course is divided into an elementary course and an advanced course. It is suggested that that rather arbitrary division should in no way prevent instructors or schools of optometry from making further divisions.

The Elementary Course should include:

(a) History of Glass
(b) History of Spectacles
(c) Machinery
(d) Abrasives, all kinds
(e) Lens patterns
(f) Elementary Practise in surveying, edging, neutralizing and marking
(g) Transpositions
(h) Bridges

The Advanced Course should include:

(a) Practise in Advanced Surfacing, truing surfacing tools
(b) Fitting Lenses to Frames and Mountings
(c) Advanced Neutralizing
(d) Advanced Lens Marking
(e) Tools
(f) Bridges
(g) Face and Frame Measurements
(i) Prescription Writing

1. Elementary Course

A. History of Glass:

A discussion of the general uses of glass in the arts, sciences, and in commerce. The handicap of the world if there were no glass, affecting shipping, household, manufactories of all kinds, astronomy, biology, bacteriology, physiology, chemistry, photography, electricity, engineering, optics, optometry, works of art such as Tiffany ware, Bohemian ware, Venetian ware, etc., etc.

The story of the discovery of glass by Phoencian sailors. The evidences of glass making by Egyptians. The making of glass in Italy, France, England and America. The work of such men as Dullond and Guinaud. Definition of such terms as "lehr," "batch," "pot," "stirring rod," "lime" and "lead" glass, etc.

A discussion of the ingredients used in the making of glass. Temperature for making glass. The making of a "pot." The work of the Technical Laboratory at Jena, Prof. Abbe, Dr. Schott, Chance Bros., Bausch and Lomb. (Procure exhibit from B. & L.) the making of lens blanks.

B. History of Spectacles:

The work of the Chinese. Nero. The old itinerant peddler and his clownish dress and tricks. The story of Salvinius d'Amato and the monk of Spina. Pictures or specimens of old time spectacles. Roger Bacon. Publications by the American Optical Company.

C. Machinery:

The work of the optician and the optometrist. A discussion of the need and the amount of machinery; taking into consideration the needs and conveniences of the optometrist in the town or small city as compared with the optometrist in the large city.

A discussion of kinds of edging tools,— the old Craigleith and the modern composition stone; the large, small, wide, and narrow stones. Their care. Speed. Place in shop or in part of an office. Automatic edging machinery. Surfacing machinery. The care of the motor and machinery including belting. Drilling machinery. Polishing ma-

chinery. Their care. Special machinery. Lens cutting machinery.

D. Abrasives:

Definition. The use of emery,— rough, smooth and fine. Use of carborundum, sand. Compare all kinds of so-called grinding abrasives. Use of rouge, so-called "black" rouge, polishing cloths, pitch polishing and "putty" powder. Method of mixing the different abrasives for use. "Washing" emery.

E. Lens patterns:

The making of all kinds of round, oval and odd shaped lens patterns of different dimensions out of zinc or other kinds of workable material that can be used for this purpose.

F. Elementary Practice in Surfacing, Edging, Marking, and Neutralizing:

(a) *Surfacing:* Selection of blank. Selection of block and lap. Use and composition of pitch. Grinding of weak lenses and of strong lenses. Methods used in factories grinding large quantities at a time. Making of cement for holding polishing cloth to lap. Using rouge or other polishing material. The need for cleanliness. Method of polishing used in factories in the polishing of large quantities of lenses at a time.

(b) *Edging:* Hand edging showing various methods for frame and for frameless. Particular stress on the correct manner of holding the lens. The necessity for maintaining size and shape.

(c) *Neutralizing:* Neutralizing simple plus and minus spherical lenses. Neutralizing simple plus and minus cylinders.

(d) *Marking:* Marking simple plus and minus spherical lenses. Marking simple plus and minus cylinders.

G. Transpositions:

Elementary practise in finding the presbyopic quantity when the distance and the reading is given,— using simple spherical lenses and simple cylinders. Finding the reading quantity when the presbyopia and the distance are given. Finding the distance quantity when the presbyopia and the

reading are given. Review the writing of compound lenses in three different ways.

H. Bridges:

Elementary practise in the making of bridges using soft iron wire of 3½ to 4 inches in length for the purpose of learning the names of all parts of a bridge and giving practise and experience in noting symmetry and alignment of all parts. Using the straight shank first, changing it by bending into a so-called "47" shank or bridge. Bending these large bridges to some other measurement, using straight shank first then the "47" shank. Pliers needed.

NOTE: It is rather evident that the modern optometrist will not be called upon to do such work as surfacing, making lens patterns, or handling machinery of the kind used in the optical shop. There is even a question whether or not he will be called upon to do edging. However, practise in that kind of work will do two things for him. First, it will tend to make him more appreciative of the work and the problems of the man who is filling his prescriptions, and, Second, it will give him much needed practise in the handling of tools, develop his digital skill and prepare him for the handling, effectively, the tools needed in the fitting and adjusting of frames and mountings to nose and face. It is all intended in the interest of proficient thoroughness.

2. Advanced Course.

A. Advanced Surfacing:

Grinding and polishing cylinders and toric lenses. Use of possible different types of machinery. Though this work is titled "advanced surfacing" it does not mean that the student is to become an expert lens grinder. It is given as a matter of practise to teach the prospective optometrist something in the way of understanding lens grinding and polishing.

B. Lens edging:

Fitting lenses of all kinds to frames especially those of shell or zylonite variety. The half eye frame. The making of the "Boston" shape type of lens. Drilling lenses and fitting them to mountings. Maintaining shape, size, and correct position. Automatic edging.

C. Advanced neutralizing:

Neutralizing compound plus and plus, minus and minus, and minus and plus lenses. Neutralizing these compound lenses with sphere and cylinder in the interest of accuracy rather than with spheres and transposing. Neutralizing prisms, sphero-prisms, cylinder-prisms, and sphero-cylinder-prisms. Decentering.

D. Advanced lens marking:

Marking plus and plus, minus and minus, and minus and plus compound lenses. (Both the elementary and the advanced marking should first be done by hand). Use of and practise in "marking" instruments or devices. "Kryptoks," "One-piece," and similar lenses. Advanced transposition.

E. Tools:

The student must be impressed with the need for equipping himself with the necessary tools at an early date. He should be encouraged to procure good, nickel-plated or other well finished tools. His outfit should include all kinds of pliers, if possible two of each kind, screw drivers for frames, frameless mountings, and finger-piece mountings. Large coarse files, small smooth files,— half round and flat,— rat tail files, reamers, and burnisher, small hammer, rivets, assorted screws.

F. Bridges:

Making of bridges from real bridge blanks. First with the straight shank and then with the "47" shank. Bending those bridges from one size to another first using the straight shank and then the "47" shank. When that practise has been completed bend the bridges on frames from one size to another first with the straight shank and then using the "47" shank. Later fitting a spectacle to a nose making the necessary alterations in a bridge that is not of the proper dimensions.

G. Soldering:

There is not much soldering necessary these days. Still as a means for increasing the student's mechanical ability and testing his mechanical ingenuity it gives admirable practise. Begin with

soldering broken bridge shanks and the foot of a bridge, then end pieces and finally eye-wire. Going first from the steel and alumnico frame to the gold frame. Using soldering lamp, blow-pipe, borax plate, borax, silver solder, gold solder, and soldering block,— asbestos or charcoal. Need for cleanliness.

Method of cleaning soldered part; steel, alumnico, gold filled and gold. Use of various kinds of brushes and buffs, tripoli and rouge in stick form.

H. Face and Frame Measurements:

Selection of frames and mountings. Face measurements. Adjusting and fitting of frames, bridges, temples, guards, and finger-piece mountings. Selection of proper sized lenses. Selection of frames and mountings for certain needs of patient. Putting frames out of shape and putting them into shape. Angling and tilting of bridges,— shank or crest or temples. Fitting tables. Hygiene of hands.

I. Prescription writing:

The proper sequence and with full detail. Method of keeping record for shop and for filing. Method of checking in order to establish accuracy. Use of certain instruments for finding stress in mounted lenses and for testing axes.

OUTLINE SYLLABUS ON PHYSIOLOGICAL OPTICS

Preamble.

The study of physiological optics is an advanced course in the general study of Optometry. The prerequisites should include general anatomy and physiology, anatomy and physiology of the eye, theoretic optics, and at least elementary theoretic optometry. In addition a course in at least elementary psychology is recommended. It is fairly safe to believe that this recommendation will sometime not far distant in the future be regarded as a very essential prerequisite for the reason that a number of topics now studied under the general caption of physiologic optics are what must some day be recognized and properly termed as psychologic optics.

In considering this course the same questions of doubt arise as arise in considering such a course as would come under the caption of theoretic optometry. Those questions are: On which side of a dividing line may be regarded as belonging purely to physiologic optics and which side to theoretic optometry. Or, should physiologic optics and theoretic optometry be placed under a general caption and what should such a caption be?

It is not the purpose of this syllabus to settle those questions either one way or another. At this time the intention is merely to present them for thought so that at some later time when this syllabus is revised a decision may be reached and a proper disposition of the now rather confusing question may be made.

For our present purposes physiologic optics may be regarded as a study which embraces the optics of all parts of the eye in relation to the physiology of the eye associated with the phenomenon of vision. Further, it must of necessity also consider the various extrinsic accessories of the eye in their relation to the physiologic mechanics of the internal structures of the eye. In other words, physiologic optics is theoretic optics and mathematics applied to specific anatomy and physiology of the eye. And here again, there must be pointed out that no specific function of any of the higher centres can be adequately studied or understood unless there is a basic and concurrent course in psychology given. For example, the phenomena of judging distance, thickness, or optical illusions is almost pure psychology and not physiology.

It is suggested that the course should be divided more or less into two parts. The first part or first term should include: (A) General Optical Principles; (B) Optic System of the Eye;

(C) The False Images; (D) Ophthalmology; (E) Circles of Diffussion; (F) Ocular Spherical Aberration; (G) Chromatic Aberration; (H) Regular and Irregular Astigmatism; (I) Entoptic Phenomena; (J) Accommodation; (K) The Pupil. The second part or second term should include (A) Retinal Changes under Influence of Light; (B) The Light Sense; (C) The Law of Listing; (D) Ocular Movements; (E) The Color Sense; (F) The Form Sense; (G) Projection of Visual Impressions; (H) Monocular Perception of Depth; (I) Binocular Perception of Depth; (J) Optical Illusion.

The foregoing outline has been largely taken from "Physiologic Optics" by Tscherning but the subjects have been given different positions or placed in different order in an attempt to separate that which may be regarded as physiological from that which in a department of psychology would be regarded as coming under experimental psychology.

1. PART ONE OR FIRST TERM.

A. General Optical Principle:

A brief general review of necessary theoretic optics such as the optical properties of bodies, reflection and absorption, mirrors, refraction of plane and spherical surfaces, thin lenses, and the theory of Gauss.

B. Optic System of the Eye —

(a) The optic constants of the eye including position of the various refracting surfaces, the radii of those surfaces together with the indices of the ocular refractive bodies.

(b) The optic system of the eye including the various principal points, the nodel points, focii and refractive power of the various ocular refracting bodies.

(c) Aperture of the system.

(d) Point of fixation, visual line, optic axis, angle alpha, and useful image.

(e) Retinal field of vision.

C. The So-called False Images of the Eye:

(a) General presentation of optics involved.

(b) The images of Purkinje and the manner of observing and studying them.

D. Ophthalmology:

The general principles and optics involved should already have been covered in theoretic optics and

theoretic optometry and should be known therefore by the time this physiologic application of the principles involved is reached.

(a) Results of corneal measurements.
(b) Measurement of the angle alpha.
(c) Determination of the position of the internal surfaces, centres of the internal surfaces and of the radii.
(d) General discussion of ophthalmology in relation to optical constants and changes during accommodation.

E. Circles of Diffussion:

(a) The line of sight;
(b) Experiments of Czermak, Scheiner, and Mile;
(c) The optometer of Thomas Young.
(d) The effects of the stenopaic hole.

F. Ocular Spherical Aberration:

(a) Aberrations of the human eye.
(b) Experiments of Volkman and of Thomas Young.

G. Ocular Chromatic Aberration:

(a) General statement of chromatic aberration of the eye.
(b) Various experiments, results, phenomena of dispersion and experimental correction of chromatic aberration.

H. Regular and Irregular Astigmatism:

(a) General theoretic optics involved.
(b) Various kinds of regular astigmatism.
(c) Corneal and total astigmatism.
(d) Traumatic, and conical corneal astigmatism.

(NOTE: In this division an instructor unless he is careful will find a ready opportunity to confuse the presentation of the subject from an optometric point of view with the presentation from a physiologic point of view.

I. Entoptic Phenomena:

(a) Observing entoptic phenomena.
(b) Analysis.
(c) Entoptic observation of the vessels of the retina.
(d) Other entoptic phenomena.

J. Accommodation:

(a) Historical presentation.
(b) The experiments and theory of various scientific researches.

K. The Pupil:

(a) Movements of the pupil.
(b) Advantage of the position of the pupil near the nodal point.

2. PART TWO OR SECOND TERM.

A. Retinal Changes Under the Influence of Light:

(a) Retinal or visual purple.
(b) The influence of light.

B. The Light Sense:

(a) Psychological laws.
(b) Measurement of light sense and results.

NOTE: It must be evident that such a law as that of Fechner, the measurement of the threshold of vision, and the speed of visual perception which naturally fall under this division are purely psychological experiments.

C. The Law of Listing:

(a) Centers and axes of rotation.
(b) Law of listing.
(c) Experiments of Meissner.
(d) Historical presentation.

D. Ocular Movements:

(a) "Eye-jumps" or jerky movements of the eye.
(b) Relative movements of the eye.

E. The Color Sense:

NOTE: This and the following divisions must be regarded as belonging to experimental psychology. At the present time these divisions may be given merely from the standpoint of giving general information in each subject to the student. This division should include a brief discussion and demonstration of:

(a) Phenomena of contrast and after image.
(b) Definition of such terms as brightness, intensity, tint, shade, etc.

(c) Demonstration between psychological mixture of colors and the physical mixture of pigments.

F. The Form Sense:

(a) The dependence of form appreciation upon education, experience, and comparison.
(b) The relation of central to peripheral visual acuity and the effect of varying degrees of illumination.

G. Projection of Visual Impressions:

(a) General law.
(b) Projection of visual field, size of retinal image.
(c) Projection in monocular and binocular vision.

H. Monocular Perception of Depth:

(a) Influence of accommodation.
(b) Influence of judgment of distance by distance, experience, comparison, and illumination.
(c) Influence of the parallax.

I. Binocular Perception of Depth:

(a) Influence of convergence and accommodation.
(b) The sterescope and binocular vision.
(c) Judgment affected by influence of distance, experience, comparison and illumination.
(d) Identical points of the retina.

J. Optical Illusion:

(a) Filled and empty spaces.
(b) The effect of diverging and converging lines.
(c) Interruption.
(d) The lens of irradiation.
(e) The effect of suggested perspective and the apparent necessity for a near and distant point of fixation.

OUTLINE SYLLABUS ON DISEASES OF THE EYE.

Preamble.

For the present and perhaps for some time to come the work of the optometrist in relation to the diseases of the eye should be a relationship of normal diagnosis only. Therefore, this course must be built upon (a) General anatomy and physiology, and, (b) anatomy and physiology of the eye. Those two courses should be pre-requisites. In fact it would be wise to regard elementary theoretic and elementary practical optometry also as requisites preceding the study of diseases of the eye, while physiologic optics should be a parallel course. These recommendations are made in the interest of developing a clearer and more comprehensive understanding of so difficult a subject as diseases of the eye even when studied from the standpoint of normal diagnosis. Besides, optometry schools are not at present equipped to give any other kind of information in the subject. Neither are they concerned with going into the subject beyond the needs of the optometrist and those needs are already clearly defined by the subject of optometry itself. Of course, if a school can show by lantern slide, or better still by clinical subject the diseases under discussion the student will be just that much better taught and qualified to recognize those conditions which come within or without his limitations.

The course should include ocular pathology nomenclature, objective observation, and subjective observation. These should be preceded by instruction in the relationships of optometrist to patient and to the oculist.

1. Relation of optometrist to physicians, oculists, and patients:

A. Optometrist and physician:

The value of friendliness with the general practitioner. The necessity of reporting back to him promptly. The need for being able to converse in medical terminology intelligently.

B. Optometrist and Oculist:

The need for friendliness and courtesy. Carrying on one's practise up to the standards of medicine. Commanding respect by doing good, careful work. Sending patients with a letter of

introduction and asking for a report in order to keep own records complete. The value of a telephone communication.

C. Optometrist and Patient:

The necessity for making the patient feel he is being sent to the oculist because of the optometrist's interest in procuring the best treatment and service for him. By attitude and word indicate to the patient it is honesty of purpose that is the cause of sending him to the oculist, also that it is because the optometrist knows his business.

D. Optometrist and other professions:

Dentists, osteopaths, illuminating engineers, etc.

2. General Nomenclature of Pathology of the Eye:

A. Definitions:

Pathology, etiology, inflammation, suppuration, infiltration, cul-de-sac, tension, endation, irritation, infection, malignant, congenital, lupus, congestion, gumma, hemorrhage, mydriatic, cycloplegic, tumor, cancer, bacteria, atrophy, hypertrophy, synechia, anesthesia, excision, incision, eruption, pulsation, cautery, traumatism, etc.

The object of giving these definitions is obvious. The student in study of diseases must learn a new language. He must acquire a suitable vocabulary as soon as possible in order to readily understand his text book and the language of the instructor.

In addition it seems very essential that instruction be given in the fundamental defenses of the internal tissues and tissue juices of the body. A discussion of phagocytic action, bacteriolysis, the action of antibodies, and immunity, passively or actively acquired should consume a considerable amount of time as preliminary to the study of the pathology of the eye.

3. Objective and Subjective Observation:

A. Objective observation:

Examination with magnifying lens of all outer parts of the eye and its accessories. Exploration

of the anterior chamber and lens. Use of oblique illumination and magnifying lens. Use of transilluminator and magnifying lens. Careful location of all foreign bodies, opacities, or unusual conditions. Explain possible meaning of general appearance of patient, his peculiarities, and apparent characteristics. Use of ophthalmoscope. Eversion of lids.

B. Subjective observation:

Past and present history of the patient concerning his habits, illnesses, use of drugs, tobacco, coffee, tea, etc. History of chronic illness or of possible family inherited tendencies.

4. Diseases of the Eye and its Accessories:

A. Lids, canthi and accessories:

Blepharitis, meibomian cyst, warts, stye, "black eye," trachoma and other common diseases. These to be discussed rather thoroughly. Other diseases such as ulcer, cancer, dacryoadenitis, etc., should be described and a superficial description of treatment and prognosis. Hygiene and advice should be indicated in the first mentioned group of diseases. The relation of errors of ocular refraction to certain diseases of the lids should be fully discussed. Use and abuse of poultices and compresses. The value of clean warm water with a small addition of boric acid. Diseases of the lachrymal apparatus. Traumatic injuries and their first aid treatment. Ptosis.

B. The Eye:

(a) Conjunctiva. Various kinds of conjunctivitis. The prevention of ophthalmia neonatorum as prescribed by law. This disease should receive the fullest discussion. As a cause of more blindness than all other causes combined. Hay fever.

(b) Cornea. Various kinds of ulcers. Infections and inflammations, opacities and traumatisms. Arcus senilis. Descriptions should include brief statement of treatments and prognoses.

(c) Iris. Iritis of various kinds or due to various causes. Adhesions. Paralyses. Different kinds of pupils and their causes. Pathologic

conditions affecting the anterior chamber. Traumatisms due to accident or operation. Effect of various kinds of drugs.

(d) Ciliary region. Tendency of diseases in this region to spread to other parts of the eye. Relation of disease in this region to diseases of other parts of the eye.

(e) Lens. Various kinds of cataracts and their possible causes. Relation to health and general disease. Relation to focal infection. Dislocated lens and other traumatisms. Cataract extraction. Instruction and description should be thorough. Lens prescription after removal of lens.

(f) Choroid. Choroiditis due to various conditions. Atrophy. Relationships to other disease and other parts of the eye. Prognoses. High myopia. Hemorrhages. Colaboma. Albinism.

(g) Retina. Appearance in health; in disease. "Yellow spot," disc, atrophy, and all forms of retinitis. Detachment. Embolism and thrombosis. Snow blindness. Amblyopia. Scotoma.

(h) Vitreous. Conditions as the result of other diseases of the eye. Traumatisms. Muscae volitantes. Foreign bodies, other opacities.

(i) Optic nerve. General pathology of the nerve. Pathologic conditions of nerve and relation to appearance of disc. Inflammation, neuritis, atrophy, single or double, and effect of pathologic conditions on sight.

C. Special consideration:

Such diseases as cancerous condition of muscles or orbit, tumors of all kinds, gonorrhea, syphilis, paralysis, glaucoma, exophthalmos, etc. The effect of certain diseases such as the venereal diseases, meningitis, diabetes, scarlet fever, measles, small-pox, influenza, malaria, and the effects of alcohol and tobacco. Diseases of the lachrymal apparatus. Special consideration of the effect of certain diseases of other parts of the face in relation to sympathetic disease of the eye. The effect of cranial contusions, concussions, and fractures.

D. Hygiene and First Aid:

The care of the eye from the standpoint of its exposure to dust, dirt, wind, and infection. A brief consideration of proper natural and artificial

illumination. The use of hot and of cold compresses. The use of boric acid. Its abuse. First aid treatment in burns, acids, alkalis, foreign bodies, and blows. The removal of foreign bodies from the anterior surface of the eye (conjunctiva) and the lids. What the optometrist may do and what he must not do in rendering first aid.

Text books: May's Diseases of the Eye.

Collateral reading: Hygiene the Optometrist Ought to Know,— Woll.

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